

1994-1996

National Automotive Sampling System Crashworthiness Data Systems





U.S. Department of Transportation
National Highway Traffic
Safety Administration

***National Automotive Sampling System
Crashworthiness Data System***

1994 -1996

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Executive Summary

During the period 1994 through 1996, an estimated 11.4 million vehicles each year were involved in police-reported traffic crashes. Approximately 93 percent of these were automobiles, pickup trucks, vans, and sport/utility vehicles, collectively referred to as *passenger vehicles*. Pickup trucks, vans, and utility vehicles are collectively referred to as *light trucks*. Most of these vehicles were not seriously damaged: only 26 percent of them were towed from the crash scene due to damage sustained in the crash. Approximately 47,000 passenger vehicles were involved in fatal crashes each year.

This report focuses attention on occupants of those passenger vehicles that were towed from the crash scene. NHTSA's National Automotive Sampling System (NASS)/ Crashworthiness Data System (CDS) collects detailed information on towed passenger vehicle crashes, employing trained, professional crash investigation teams. The in-depth data collection, scientific protocols, and professionalism of those involved make the NASS/CDS database a valuable resource to many in the traffic safety community.

NASS data are used by government, industry, and the private sector to conduct research, identify injury patterns and mechanisms, provide a basis for regulatory decision making, and provide a means of evaluating the association between occupant injury and various crash-related characteristics.

Some highlights of the report include:

- ! Passenger cars comprise the largest segment (about 76 percent) of the passenger vehicles found in the NASS/CDS, and hence, in police-reported towaway crashes. In the report, Passenger cars are treated separately from the remaining vehicles, which have been grouped together as light trucks.
- ! Occupancy patterns for towed crash-involved cars and light trucks were very similar: about two-thirds (about 67 percent) of the time, the only occupant of a towed crash-involved car or light truck was the driver. A front-seat passenger was present in the car about 21 percent of the time, with passengers in the second and further seats about 13 percent of the time. For occupants of light trucks, front-seat passengers were present 20 percent of the time, with passengers in the second and further seats about 17 percent of the time.
- ! One of the health-care consequences of motor vehicle crashes is the burden on emergency and health services. About 243,000 occupants of passenger vehicles were hospitalized each year as a result of police-reported traffic crashes. Another 1,321,000 occupants were transported to a medical facility and released, and 369,000 occupants were treated at the scene of the crash.
- ! Contact with the steering assembly accounted for about 10 percent of the minor injuries (AIS 1-2) but about 15 percent of the serious-maximum (AIS 3+) injuries. A similar pattern was observed for contact with the interior side surface, comprising 7 percent of the minor injuries and 15 percent of serious and greater injuries.
- ! Approximately 288,000 injuries to occupants resulted from contacting an air bag. Around 97 percent were minor injuries, and about 1 percent were serious injuries.

Executive Summary

- ! About 4 percent of the towed cars in crashes rolled over, compared with 16 percent of the towed light trucks.
- ! Eight percent of car occupants in rollover crashes were ejected; the remaining crash types exhibited ejection rates in the range of 0.1 to 1.5 percent.
- ! The belt use rate for all occupants of passenger vehicles was about 75 percent.
- ! The alcohol involvement rate for drivers of both passenger cars and light trucks in traffic crashes is highest for the age group 25-34 years.
- ! The alcohol involvement rate for all drivers of light trucks in traffic crashes is almost twice that for drivers of passenger cars.

1. Introduction

Background

The National Automotive Sampling System (NASS)—formerly, the National Accident Sampling System—is the mechanism through which the National Highway Traffic Safety Administration (NHTSA) collects nationally representative data on motor vehicle traffic crashes to aid in the development, implementation, and evaluation of motor vehicle and highway safety countermeasures. The NASS was originally designed and implemented in 1979 to support highway and motor vehicle safety programs. The NASS program was reevaluated in the mid-1980s. The evaluation team concluded that the program should be redesigned to focus on enhanced in-depth analyses of passenger vehicle crash protection performance. This reevaluation resulted in changes that were implemented by NHTSA's National Center for Statistics and Analysis (NCSA) in January 1988.

To enhance its applicability in addressing crashworthiness issues, the NASS was divided into two parts: (1) the General Estimates System (GES), which collects data on an annual sample of approximately 50,000 police-reported traffic crashes; and (2) the Crashworthiness Data System (CDS), which collects additional detailed information on an annual sample of approximately 5,000 police-reported traffic crashes involving passenger vehicles towed from the crash scene due to damage resulting from the crash. In this report, the term *passenger vehicles* is used to refer to all cars, pickup trucks, vans, and sport/utility vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less. The term *light trucks* is used to refer to pickup trucks, vans, and sport/utility vehicles.

Unlike the CDS, the GES does not investigate crashes. Its only source of information is the police crash report. It does provide the data needed for assessments of the state of and trends in motor vehicle and traffic safety. An annual report is published each year that describes the data availability from the NASS/GES and the Fatality Analysis Reporting System (FARS). The FARS is a census of all fatal crashes that occur in the United States and Puerto Rico.

Objective

The objective of this report is to illustrate the availability, resolution, and applicability of crash, vehicle, occupant, and casualty attributes for the characterization of vehicle crash protection performance on U.S. roads during the years 1994 through 1996, based on the NASS/CDS records for those years.

Vehicles Under Consideration

This report addresses towed passenger cars, pickup trucks, vans, and sport/utility vehicles under 10,000 pounds GVWR. Sport/utility vehicles include jeeps, truck-based station wagons, utility vehicles, and other van- or truck-based motor vehicles under 10,000 pounds GVWR that are not cars, pickups, or vans. Motorcycles, bicycles, horse-drawn carriages, etc., are not included.

Introduction

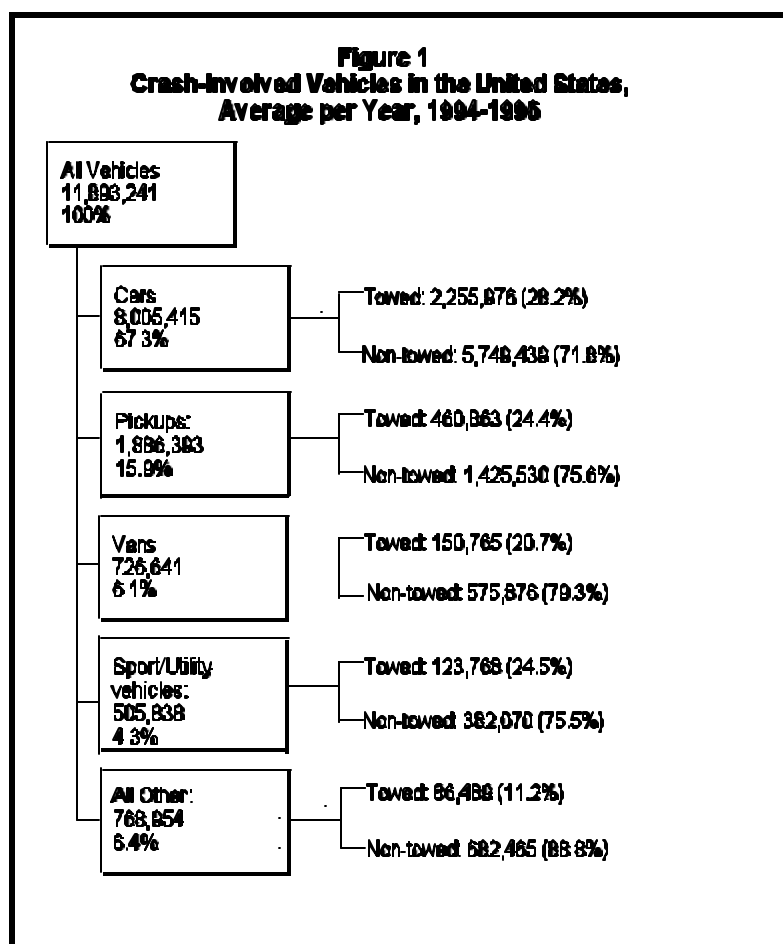
CDS Estimates

Unless otherwise noted, all the CDS statistics presented in this report are estimates -not exact counts- generated from a sample of crashes that occurred in the 3-year period from 1994 through 1996. Descriptions of the CDS sample design and the procedure used to obtain the data shown in the tables are contained in Appendix B. Since the CDS is a probability sample, the sampling error of every CDS statistic can be estimated. Approximate sampling errors for the weighted average counts over the 1994-1996 period are provided in Appendix F.

2. Perspective

A perspective on crash-involved vehicles is provided in Figure 1, which shows the annual incidence averaged over the years 1994-1996.

The number of vehicles of all body types involved in police-reported crashes each year in the United States is about 11,400,000; about 93.0 percent of these are passenger cars, pickups, vans, and sport/utility vehicles. In this report, pickups, vans, and sport/utility vehicles are collectively referred to as "light trucks." Each of these body types is subdivided into towed and non-towed vehicles.



Note: For those vehicles where tow status is unknown it is assumed that the vehicles were not towed. While all vehicles are addressed by NASS/GES, only towed passenger vehicles are addressed by NASS/CDS.

Source: NASS/CDS and NASS/GES, 1994-1996.

Perspective

The towed vehicles shown in Figure 1 are investigated in the NASS/CDS, because of interest in the crashworthiness of vehicles involved in the more severe crashes. These are the subject of the following analyses and illustrations, with emphasis on cars. During the period 1994-1996, the average number of registered passenger vehicles per year, as reported by R.L. Polk & Co., was 185,765,664, of which 123,283,749 (66.4 percent) were passenger cars and 62,481,915 (33.6 percent) were light trucks.

3. Vehicle Crash Data

Car Size

About 2,544,000 cars are towed away from the scene of traffic crashes every year. Table 1 shows the distribution of these cars by weight class. Passenger cars made up about 76 percent of all NASS/CDS towed vehicles; the remaining 24 percent were light trucks (see Table 5).

Table 1 Crash-Involved Towed Cars by Weight Class, 1994-1996			
Weight Class	Total Sample	Annual Average	
		Percent	Count
Small (<2,500 lbs)	4,762	33.3%	846,069
Mid-Size (2,500-3,000 lbs)	4,536	35.0%	890,969
Large (>3,000 lbs)	4,631	30.3%	772,190
Unknown Size	256	1.4%	35,066
Total	14,185	100.0%	2,544,293

Examples of Weight Class:

Small—Ford Tempo, Mercury Tracer, Saturn, Nissan Sentra, Honda Civic

Mid-size—Plymouth Sundance, Ford Probe, Honda Prelude, Toyota Celica

Large—Ford Taurus, Dodge Dynasty, BMW 3 series, Pontiac Grand Prix

Car Crash Modes and Areas of Damage

Table 2 and Figure 2 show the distribution of towed cars among the primary crash modes and areas of damage. Frontal damage in nonrollover car crashes is the most frequent crash type, accounting for about 58 percent of all towed car crashes. Side damage and all other nonrollover crash types account for 29 percent and 9 percent, respectively. Rollover car crashes account for the remaining 4 percent.

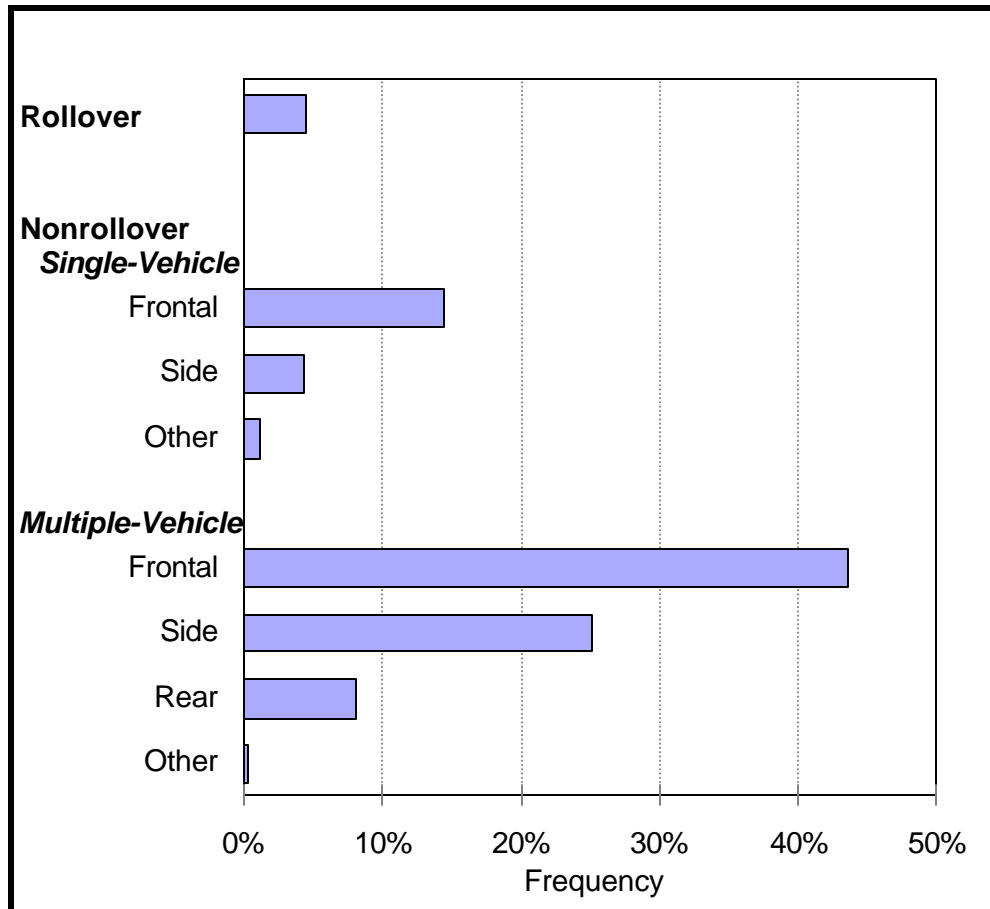
These crash frequencies do not reflect the distribution of harmful outcomes to the car occupants. Certain crash types are associated with higher proportions of injury. For example, although rollover occurs in about 4 percent of towed car crashes, it is responsible for about 13 percent of the harm-weighted injuries to car occupants in towed crashes. On the other hand, car crashes with rear damage account for about 9 percent of the cases but are responsible for about 5 percent of the harm-weighted injuries to occupants (see Table 25).

Vehicle Crash Data

Table 2 Distribution of Towed Car Crash Modes and Areas of Damage, 1994-1996			
Crash Mode and Area of Damage	Total Sample	Annual Average	
		Percent	Count
Rollover			
1-3 Quarter Turns	568	2.8%	71,340
4+ Quarter Turns	443	1.4%	36,254
End Over End	38	0.1%	1,827
<i>Total Rollover</i>	<i>1,049</i>	<i>4.3%</i>	<i>109,421</i>
Nonrollover			
Single-Vehicle			
Frontal Damage	1,989	14.2%	362,350
Side Damage	565	4.1%	104,425
Rear, Top, or Under Damage	73	1.0%	25,007
Total Single-Vehicle	2,627	19.3%	491,782
Multiple-Vehicle			
Frontal Damage	6,196	43.4%	1,104,169
Side Damage	3,380	25.0%	636,588
Rear Damage	919	7.9%	200,319
Top or Under Damage	14	0.1%	2,014
Total Multiple-Vehicle	10,509	76.4%	1,943,090
<i>Total Nonrollover</i>	<i>13,136</i>	<i>95.7%</i>	<i>2,434,872</i>
Total Towed Car Crashes	14,185	100.0%	2,544,293

Note: Damage Area "Unknown" has been imputed into the known damage areas.

Figure 2
Distribution of Towed Car Crash Modes



Vehicle Crash Data

Car Crash Severity

Crash severity (delta-v in miles per hour) for cars varies generally in the range from 1 to 50 mph. Table 3 shows the distribution of towed cars by severity and area of damage. No crash severity, in terms of delta-v, can be defined for rollover crashes. Figure 3 illustrates the primary aspects of this distribution.

Crash frequency rises sharply to a peak located between 11 and 20 mph, as shown in Figure 3. This frequency drops sharply following the peak; cumulative frequency beyond 40 mph is about 0.2 percent. The same general pattern holds for all areas of damage in nonrollover crashes: front, side, and rear.

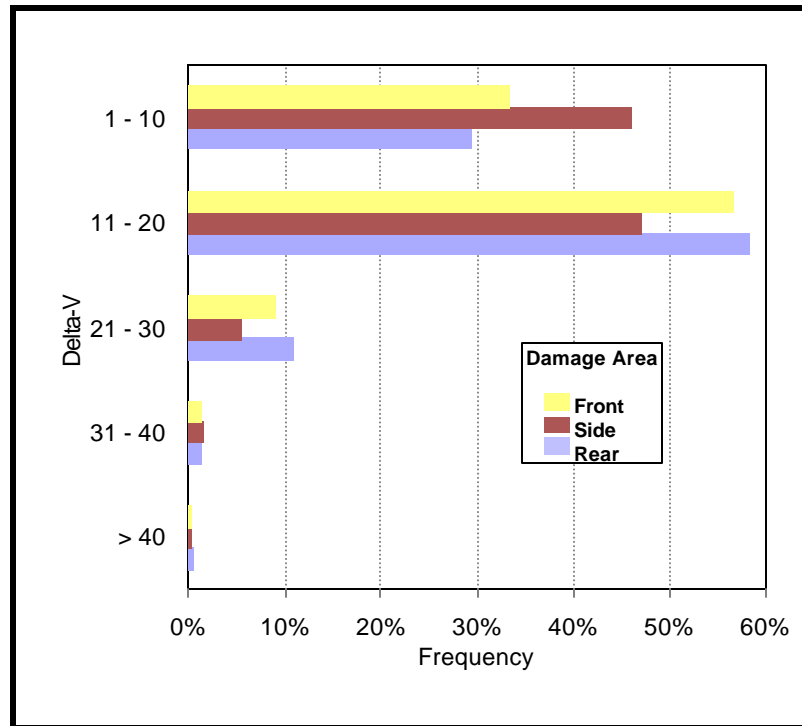
Great caution is recommended in the use and interpretation of crash severity data, for two reasons: (a) the large number of unknowns; and (b) the sharp reduction in the number of available cases as crash severity increases. For "Unknown" area of damage in Table 3, crash severity was calculated using the missing vehicle reconstruction algorithm (see Appendix E, "CRASHPC and OLDMISSPC Summary"). Area of damage "other" includes top and undercarriage, which are outside the scope of the reconstruction algorithm.

Table 3 Distribution of Towed Cars by Crash Severity (delta-v) and Area of Damage: Average per Year, 1994-1996							
Area of Damage	Crash Frequency by Crash Severity*					Unknown	Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph		
Front	217,353 33.3%	368,872 56.5%	57,659 8.8%	6,991 1.1%	1,477 0.2%	382,295 36.9%	1,034,646 40.7%
Side	144,746 45.9%	148,240 47.0%	16,480 5.2%	5,753 1.8%	242 0.1%	218,918 41.0%	534,377 21.0%
Rear	31,131 29.3%	61,872 58.2%	11,587 10.9%	1,303 1.2%	367 0.3%	44,579 29.6%	150,840 5.9%
Other	0 --	0 --	0 --	0 --	0 --	68,925 100.0%	68,925 2.7%
Unknown	4,753 56.5%	3,542 42.1%	117 1.4%	0 0.0%	0 0.0%	747,092 98.9%	755,505 29.7%
Total	397,983 36.8%	582,526 53.8%	85,843 7.9%	14,047 1.3%	2,086 0.2%	1,461,809 57.5%	2,544,293 100.0%

*For each area of damage and known crash severity, the first data row shows the number of vehicles, and the second row shows the percentage of the total number of vehicles in that row for which crash severities were known. For the "Unknown" column, the second data row shows the percentage of the total for each area of damage. For the "Total" column, the second data row shows the percentage of the grand total. NA = not available.

Figure 3
Distribution of Towed Car Crashes by Crash Severity

and Area
of
Damage,
1994-
1996



Note: Data taken from Table 3 (percentage of the total number of vehicles for which crash severities were known).

Due to the sharp rise of outcome severity as crash severity increases, the distribution of injuries to car occupants vs. crash severity differs markedly from the distribution of the crash frequency. Specifically, the injury distribution rises to a peak much faster, and drops much more slowly thereafter, than does the crash frequency distribution. For example, the injury proportions (not shown) in the five crash severity intervals used in Table 3 and Figure 3 are 10 percent, 37 percent, 28 percent, 16 percent, and 8 percent for frontal impacts, compared with the corresponding crash proportions of 33 percent, 57 percent, 9 percent, 1 percent, and about 0 percent. However, although it is true that the injury proportions exceed the corresponding crash proportions at high crash severities, it is also true that the majority of the injuries occur at severities under 40 mph. For example, in frontal impacts 92 percent of the injuries to occupants occur at severities under 40 mph; the cumulative injury proportion under 40 mph is 97 percent for side impacts and 98 percent for rear impacts.

Vehicle Crash Data

Seating Position of Car Occupants

Every year, approximately 3.8 million people are involved in crashes as occupants of towed cars. Table 4 shows the distribution of occupant seating positions for towed cars from 1994 through 1996.

The distribution pattern—about 67 percent drivers, 21 percent right front passengers, and 12 percent all other—is roughly the same as for all cars regardless of crash involvement.

Table 4			
Occupant Seating Positions in Towed Cars, 1994-1996			
Car Occupants	Total Sample	Annual Average	
		Percent	Count
Drivers	14,146	66.7%	2,532,969
Right Front Passengers	5,064	20.5%	780,160
Second Seat Passengers	3,221	11.8%	448,201
Other Passengers	287	1.0%	36,774
Total	22,718	100.0%	3,798,104

Functional Class and Size of Light Trucks

About 785,000 light trucks (pickups, vans, and sport/utility vehicles) under 10,000 pounds gross vehicle weight rating are towed away from the scene of traffic crashes every year. Table 5 shows the distribution of these vehicles by functional class and size. The annual average for these vehicles is 24 percent of all NASS/CDS towed vehicles. The remaining 76 percent are cars.

Table 5 Distribution of Towed Light Trucks by Vehicle Class and Size, 1994-1996			
Vehicle Category and Size	Total Sample	Annual Average	
		Percent	Count
Compact Pickup	1,345	29.4%	231,107
Standard Pickup	1,292	21.0%	165,241
Unknown Size Pickup	44	0.8%	6,163
Minivan	734	14.1%	110,595
Standard Van	429	9.5%	74,723
Unknown Size Van	36	0.4%	3,192
Compact Utility Vehicle	1,038	20.3%	159,594
Standard Utility Vehicle	247	4.2%	33,066
Unknown Size Utility Vehicle	12	0.2%	1,709
Total	5,177	100.0%	785,390

Vehicle Crash Data

Light Truck Crash Modes and Areas of Damage

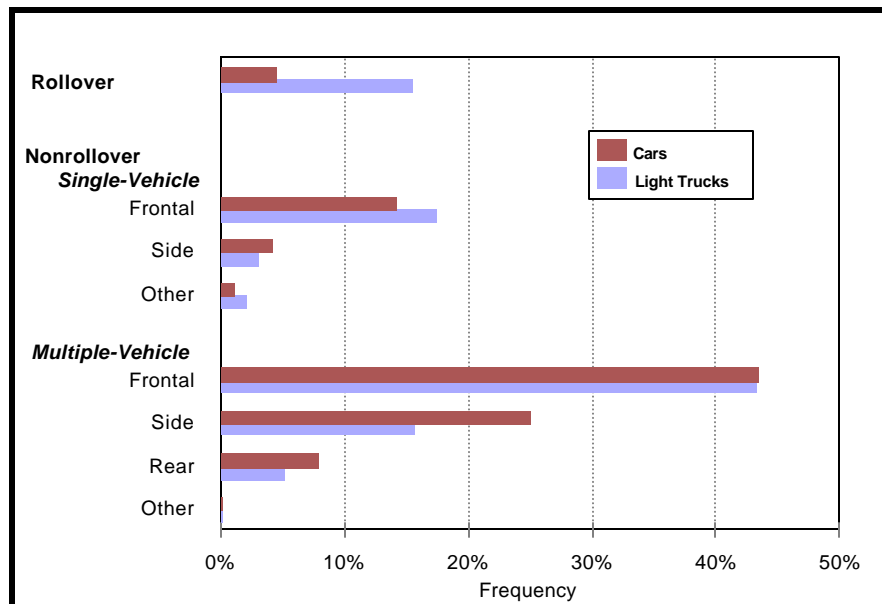
Crash mode and area of damage distributions for towed light trucks involved in crashes are generally similar to those for towed cars, except for rollover crashes. The proportion of rollovers for light trucks is 3 to 4 times that for passenger cars. Table 6 shows the distribution of towed light trucks among the primary crash modes and areas of damage.

Table 6 Distribution of Towed Light Truck Crash Modes and Areas of Damage, 1994-1996			
Crash Mode and Area of Damage	Total Sample	Annual Average	
		Percent	Count
Rollover			
1-3 Quarter Turns	613	10.0%	78,439
4+ Quarter Turns	444	5.4%	42,570
End Over End	16	0.1%	450
<i>Total Rollover</i>	<i>1,073</i>	<i>15.5%</i>	<i>121,459</i>
Nonrollover			
Single-Vehicle			
Frontal Damage	679	17.3%	135,613
Side Damage	140	3.0%	23,210
Rear, Top, or Under Damage	14	0.2%	1,918
Total Single-Vehicle	833	20.5%	160,741
Multiple-Vehicle			
Frontal Damage	2,380	43.2%	339,519
Side Damage	692	15.7%	123,457
Rear Damage	196	5.1%	40,174
Top or Under Damage	3	0.0%	40
Total Multiple-Vehicle	3,271	64.1%	503,190
<i>Total Nonrollover</i>	<i>4,104</i>	<i>84.5%</i>	<i>663,931</i>
Total Crashes	5,177	100.0%	785,390

Figure 4 shows the distribution of crash modes and areas of damage for towed light trucks, compared with the distribution for towed cars for the years 1994 through 1996.

Most of the observations for car crash frequencies and injury as a function of crash mode and area of damage are also valid for these vehicles. Rollover is the major exception: rollover crashes for light trucks are both more frequent than car rollover crashes (16 percent and 4 percent, respectively) and result in a greater proportion of harmful outcomes to the vehicle occupants (37 percent and 13 percent, respectively). The proportion of harm-weighted injuries (37 percent) associated with rollover crashes is the average for three vehicle classes -pickups, vans, and sport/utility vehicles (see Table 26). For these three classes the proportion of harmful outcomes varies significantly: rollover accounts for approximately 37 percent of all harm associated with pickups, 29 percent for vans, and 45 percent for sport/utility vehicles

Figure 4
Distribution of Crash Modes and Areas of Damage:
Comparison of Cars vs. Light Trucks, 1994-1996



Note: The "Other" category for single-vehicle crashes includes rear, top, and under damage. For multiple-vehicle crashes, "Other" includes top and under damage.

Vehicle Crash Data

Light Truck Crash Severity

Table 7 shows the distribution of towed light truck crashes by crash severity (delta-v in miles per hour) and area of damage. Most of the observations made for towed car crash frequencies and injuries to occupants as a function of crash severity are also valid for these vehicles; the same general patterns are observed. For example, for frontal impact, the injury proportions (not shown) in the five crash severity intervals used in Table 7 are 7 percent, 27 percent, 29 percent, 18 percent, and 20 percent for frontal impacts, and the corresponding crash proportions are 39 percent, 48 percent, 10 percent, 2 percent, and less than 1 percent.

A large majority of the injuries to occupants in towed light truck crashes occur at crash severities under 40 mph. For example, in frontal impacts 80 percent of the injuries occur at severities under 40 mph. The cumulative injury proportion under 40 mph is 100 percent for both side and rear impacts.

The comment made in connection with car crash severities is even more important for these vehicles: great caution is recommended in the use and interpretation of crash severity data, for two reasons: (a) the large number of unknowns; and (b) the sharp reduction of the number of available cases as crash severity increases. For "Unknown" area of damage in Table 7, crash severity was calculated using the missing vehicle reconstruction algorithm.

Table 7 Distribution of Towed Light Trucks by Crash Severity (delta-v) and Area of Damage: Average per Year, 1994-1996							
Area of Damage	Crash Frequency by Crash Severity*						Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph	Unknown	
Front	67,304 39.4%	81,479 47.7%	17,753 10.4%	3,073 1.8%	1,185 0.7%	140,678 45.2%	311,472 39.7%
Side	39,068 61.9%	20,333 32.2%	3,609 5.7%	129 0.2%	16 0.0%	53,728 46.0%	116,883 14.9%
Rear	5,021 31.9%	10,331 65.6%	364 2.3%	37 0.2%	0 0.0%	10,691 40.4%	26,444 3.4%
Other	0 --	0 --	0 --	0 --	0 --	39,652 100.0%	39,652 5.0%
Unknown	150 26.4%	406 71.5%	11 1.9%	0 0.0%	0 0.0%	290,372 99.8%	290,940 37.0%
Total	111,543 44.6%	112,549 45.0%	21,737 8.7%	3,239 1.3%	1,201 0.5%	535,121 68.1%	785,390 100.0%

Seating Position of Light Truck Occupants

Approximately 1,225,000 people are involved in crashes as occupants of towed light trucks every year. Table 8 shows the distribution of occupant seating positions for these vehicles from 1994 through 1996.

The distribution pattern—about 63 percent drivers, 20 percent right front passengers, and 17 percent all other—is roughly the same as for all light trucks regardless of crash involvement. It is also similar to the corresponding distribution for towed car crashes (Table 4).

Table 8 Occupant Seating Positions in Towed Light Trucks, 1994-1996			
Vehicle Occupants	Total Sample	Annual Average	
		Percent	Count
Drivers	5,156	63.4%	776,920
Right Front Passengers	1,726	19.9%	244,121
Second Seat Passengers	805	7.5%	92,409
Other Passengers	604	9.1%	111,064
Total	8,291	100.0%	1,224,514

4. Occupant Injury Data

Crash-Involved Occupants by Injury Severity

Approximately 3,800,000 occupants are involved in towed car crashes every year. About 49 percent of them are uninjured, and 51 percent are injured at various severity levels. Similarly, about 1,225,000 occupants are involved in towed light truck crashes per year, with about 55 percent uninjured and 45 percent injured.

Given that each injured occupant usually has more than one injury, the severity of the occupant's most harmful injury is used to characterize the seriousness of the injuries resulting from the crash. The Abbreviated Injury Scale (AIS) is used to compare injury severities, as follows:

AIS	Severity of Injury
-----	--------------------

0	Not injured
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Maximum
7	Injured, Severity Unknown

The AIS scale reflects primarily the threat to life: approximately 99 percent for AIS=6; about 51 percent for AIS=5; about 24 percent for AIS=4; declining rapidly to almost 0 percent for AIS=1. However, the scale is also used to reflect the gravity of consequences for survivors.

The distribution of injury severities for injured crash-involved occupants is shown in Table 9 for cars and in Table 10 for light trucks. The two distributions are compared in Figure 5, where it is evident that there are no major differences at any given level of injury severity.

Occupants coded as "unknown if injured" have been excluded from the detail in Tables 9 through 14, but have been included in the "Total" rows to reflect the total number of occupants involved in towed passenger vehicle crashes.

Occupant Injury Data

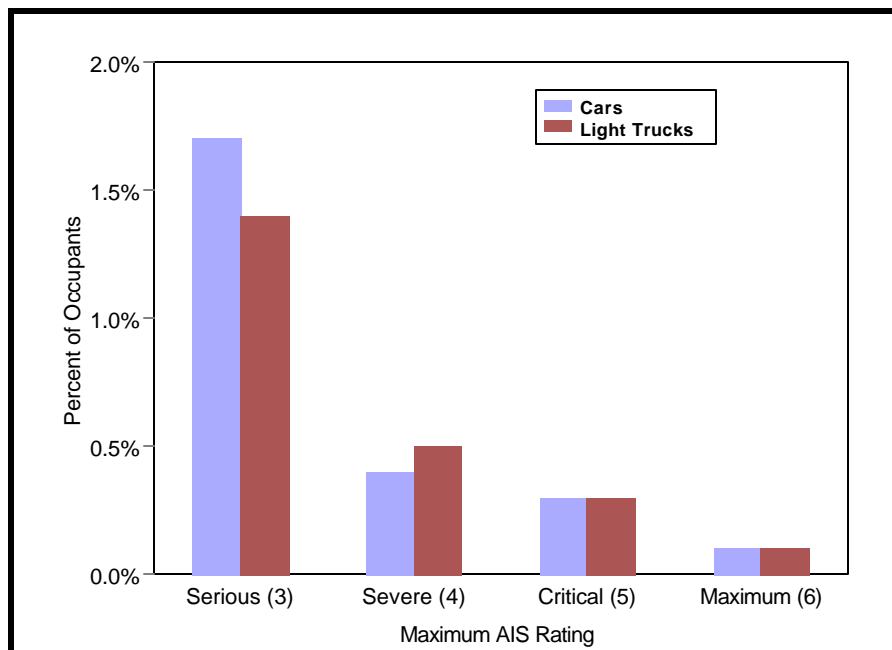
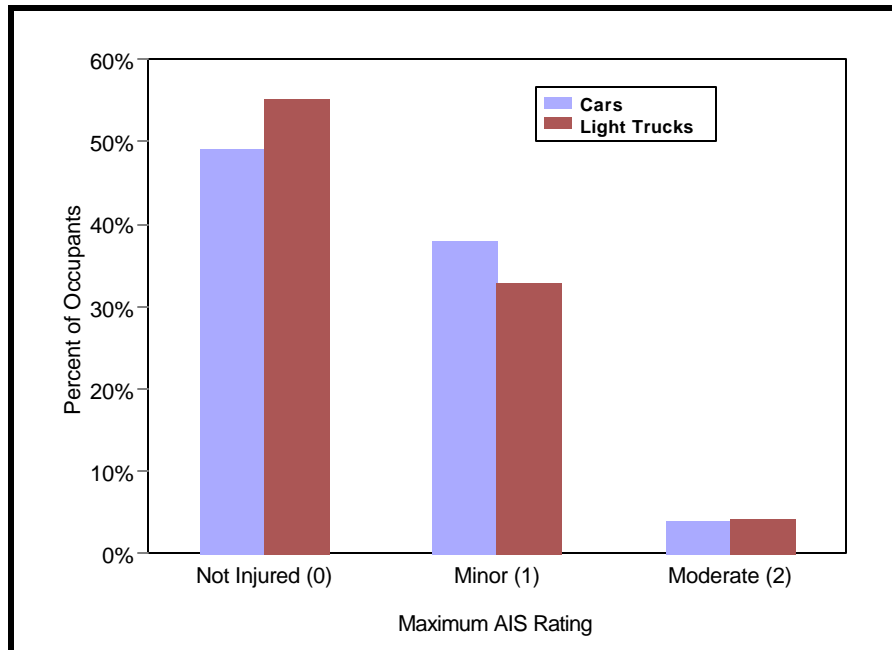
Table 9
Distribution of Crash-Involved
Car Occupants by Maximum Injury Severity:
Average per Year, 1994-1996

Maximum AIS Rating	Count	Percent
Not Injured (0)	1,863,648	49.1%
Minor (1)	1,443,812	38.0%
Moderate (2)	151,919	4.0%
Serious (3)	64,479	1.7%
Severe (4)	13,943	0.4%
Critical (5)	9,540	0.3%
Maximum (6)	3,364	0.1%
<i>Total, Known Severity</i>	<i>3,550,706</i>	<i>93.5%</i>
Injured, Severity Unknown (7)	207,341	5.5%
Total	3,798,104	100.0%

Table 10
Distribution of Crash-Involved
Light Truck Occupants by Maximum Injury Severity:
Average per Year, 1994-1996

Maximum AIS Rating	Count	Percent
Not Injured (0)	675,165	55.1%
Minor (1)	403,107	32.9%
Moderate (2)	51,367	4.2%
Serious (3)	17,490	1.4%
Severe (4)	6,225	0.5%
Critical (5)	3,156	0.3%
Maximum (6)	1,601	0.1%
<i>Total, Known Severity</i>	<i>1,158,111</i>	<i>94.6%</i>
Injured, Severity Unknown (7)	57,770	4.7%
Total	1,224,514	100.0%

Figure 5
Distribution of Crash-Involved Occupant Injuries
by Maximum Injury Severity: Cars vs. Light Trucks, 1995-1996



Occupant Injury Data

Use of Belts

The annual distribution of injuries to crash-involved car occupants by maximum injury severity and belt use is shown in Table 11. A similar joint distribution is shown in Table 12 for crash-involved light truck occupants.

Table 11
Distribution of Crash-Involved Car Occupants by Belt Use
and Maximum Injury Severity: Average per Year, 1994-1996

Belt Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	267,314	372,119	64,938	29,997	7,695	5,514	1,650	27,856	789,094
	17.6%	27.1%	45.4%	50.6%	58.4%	62.9%	65.0%	25.1%	24.3%
Automatic Belt	327,889	244,606	27,057	12,451	2,769	1,169	385	20,416	636,988
	21.5%	17.8%	18.9%	21.0%	21.0%	13.3%	15.2%	18.4%	19.6%
Manual Belt	862,436	747,911	50,379	16,788	2,584	2,029	472	62,266	1,748,457
	56.7%	54.5%	35.2%	28.3%	19.6%	23.2%	18.6%	56.2%	53.8%
Belt With Child Seat	64,747	8,933	752	18	138	51	31	315	74,985
	4.3%	0.7%	0.5%	0.0%	1.0%	0.6%	1.2%	0.3%	2.3%
Total, Restrained	1,255,072	1,001,450	78,188	29,257	5,491	3,249	888	82,997	2,460,430
	82.4%	72.9%	54.6%	49.4%	41.6%	37.1%	35.0%	74.9%	75.7%
Total Known	1,522,386	1,373,569	143,126	59,254	13,186	8,763	2,538	110,853	3,249,524
	81.7%	95.1%	94.2%	91.9%	94.6%	91.8%	75.4%	53.5%	85.6%
Unknown	341,262	70,244	8,793	5,225	758	778	826	96,487	548,580
	18.3%	4.9%	5.8%	8.1%	5.4%	8.2%	24.6%	46.5%	14.4%
Total	1,863,648	1,443,813	151,919	64,479	13,944	9,541	3,364	207,340	3,798,104
	49.1%	38.0%	4.0%	1.7%	0.4%	0.3%	0.1%	5.5%	100.0%

*For each known belt use category, the first data row shows the number of injuries and the second row shows the percentage of the "Total Known" in that column. For the "Total Known" and "Unknown" belt use categories, the first row shows the number of injuries and the second row shows the percentage of the column total. For the column totals, the first row shows the number of injuries and the second row shows the percentage of the total number of injuries. The row totals include the number of "unknown if injured".

Occupant Injury Data

Overall, belt use is approximately 76 percent for passenger car occupants and 71 percent for occupants of light trucks. These belt use rates are in agreement with the belt use rates obtained by individual state surveys reported to NHTSA each year. Not all states report belt usage rates each year. Therefore, to calculate the national safety belt use rate from the individual state use rates, each state's most recent rate is weighted by the state's proportion of the total U.S. population. Average state belt use rates were reported as 66 percent in 1993, 67 percent in 1994, and 68 percent in 1995.

Table 12
Distribution of Crash-Involved Light Truck Occupants by Belt Use
and Maximum Injury Severity: Average per Year, 1994-1996

Belt Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	107,905 19.7%	138,722 35.9%	24,137 49.7%	11,080 66.6%	4,819 82.1%	2,393 80.3%	659 62.2%	11,814 33.5%	307,417 29.2%
Automatic Belt	2,318 0.4%	1,577 0.4%	406 0.8%	17 0.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	4,318 0.4%
Manual Belt	426,032 77.6%	244,583 63.3%	23,916 49.3%	5,499 33.0%	1,050 17.9%	586 19.7%	400 37.8%	23,333 66.2%	725,857 69.0%
Belt With Child Seat	12,432 2.3%	1,565 0.4%	69 0.1%	45 0.3%	0 0.0%	0 0.0%	0 0.0%	112 0.3%	14,222 1.4%
<i>Total, Restrained</i>	<i>440,782 80.3%</i>	<i>247,725 64.1%</i>	<i>24,391 50.3%</i>	<i>5,561 33.4%</i>	<i>1,050 17.9%</i>	<i>586 19.7%</i>	<i>400 37.8%</i>	<i>23,445 66.5%</i>	<i>744,397 70.8%</i>
Total Known	548,687 81.3%	386,447 95.9%	48,528 94.5%	16,641 95.2%	5,869 94.3%	2,979 94.4%	1,059 66.1%	35,259 61.0%	1,051,814 85.9%
Unknown	126,480 18.7%	16,661 4.1%	2,840 5.5%	848 4.8%	355 5.7%	176 5.6%	543 33.9%	22,512 39.0%	172,700 14.1%
Total	675,167 55.1%	403,108 32.9%	51,368 4.2%	17,489 1.4%	6,224 0.5%	3,155 0.3%	1,602 0.1%	57,771 4.7%	1,224,514 100.0%

*For each known belt use category, the first data row shows the number of injuries and the second row shows the percentage of the "Total Known" in that column. For the "Total Known" and "Unknown" belt use categories, the first row shows the number of injuries and the second row shows the percentage of the column total. For the column totals, the first row shows the number of injuries and the second row shows the percentage of the total number of injuries. The row totals include the number of "unknown if injured."

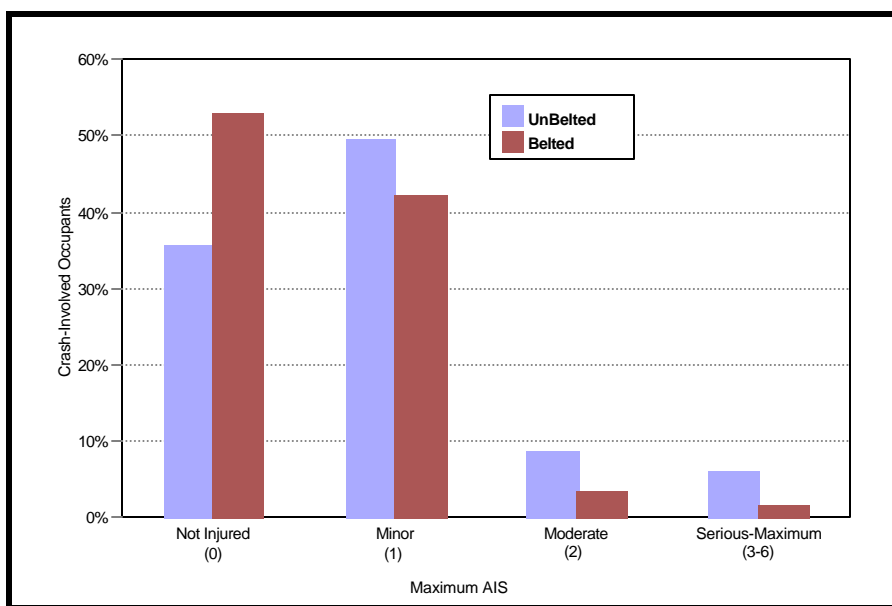
Effect of Belt Use on Injury Risk

It is evident from Tables 11 and 12 that safety belt use reduces the risk of injury, especially serious injury. This is illustrated in Figure 6 for crash-involved car occupants. In this figure, AIS ratings 3, 4, 5, and 6 have been grouped together as "Serious-Maximum" in order to deal with the small sample sizes at these high severities. As seen in Figure 6, the risk of injury (expressed in injured people per 100 crash-involved car occupants) for occupants using belts is lower than that for unbelted occupants. Moreover, this advantage appears to increase as the injury severity increases.

A word of caution is necessary when interpreting the much lower risk associated with belted versus unbelted occupants at high injury severities. It is likely that belted occupants, who usually have a higher awareness of safety than the unbelted, are also the occupants who usually avoid crashes of high severities. Thus, the advantage of belted occupants may be in part due to the fact that such occupants are exposed to lower crash severities, in addition to the crash protection provided by the belts.

Figure 6
Injury Rates for Crash-Involved Car Occupants
by Maximum Injury Severity as a Function

of
Belt
use,
1994-
1996



Injury Severity and Outcome

As discussed above (see Table 9), not all crash deaths are associated with untreatable injuries (AIS=6). Rather, the probability of death increases sharply with injury severity, and many fatalities occur as a result of one or more injuries that are generally considered survivable. Crash injury outcomes—fatality, hospitalization, needed emergency medical care, first aid treatment, and no treatment needed—are generally a function of the severity of an occupant's most severe injury, plus other factors, such as the number, severity, and type of additional injuries; the person's age and overall health; extrication time; etc.

The primary determinant of an outcome is the maximum injury severity. Table 13 shows the distribution of injuries to crash-involved car occupants according to the AIS values of maximum injury severity and the pertinent outcomes of maximum injury severities. This table also includes the number of days an occupant was hospitalized for injuries sustained in the crash as a result of the crash. An occupant may be hospitalized for observation or due to a pre-existing medical condition, as directed by the attending physician, without having received any injuries in the crash.

Fatal injuries with AIS=1 are the result of incomplete medical information by which to code the data. A similar distribution is shown in Table 14 for crash-involved light truck occupants.

Occupant Injury Data

Table 13
Distribution of Crash-Involved Car Occupants by Treatment
and Maximum Injury Severity: Average per Year, 1994-1996

Treatment	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	1,755,391 81.7%	341,630 15.9%	4,690 0.2%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	38,918 1.8%	2,147,728 56.5%
Treated at Scene	21,832 7.5%	223,483 77.1%	10,138 3.5%	538 0.2%	0 0.0%	0 0.0%	0 0.0%	33,266 11.5%	289,777 7.6%
Transported and Released	76,662 7.4%	815,911 79.1%	75,124 7.3%	12,833 1.2%	81 0.0%	16 0.0%	0 0.0%	49,492 4.8%	1,030,895 27.1%
Hospitalized 1-2 Days	3,330 3.3%	40,439 40.4%	34,389 34.4%	15,663 15.7%	2,568 2.6%	533 0.5%	0 0.0%	3,053 3.1%	99,975 2.6%
3-7 Days	326 0.6%	8,599 15.9%	21,098 38.9%	17,990 33.2%	4,269 7.9%	1,145 2.1%	0 0.0%	774 1.4%	54,202 1.4%
8-14 Days	43 0.3%	268 1.6%	3,217 18.9%	10,294 60.4%	1,759 10.3%	1,433 8.4%	0 0.0%	29 0.2%	17,044 0.4%
15-30 Days	0 0.0%	327 4.1%	1,684 21.0%	3,726 46.5%	1,237 15.4%	999 12.5%	0 0.0%	33 0.4%	8,007 0.2%
>30 Days	0 0.0%	38 1.5%	160 6.4%	1,048 41.9%	724 29.0%	504 20.2%	27 1.1%	0 0.0%	2,499 0.1%
Fatal	0 0.0%	1,077 5.6%	1,272 6.6%	2,362 12.3%	3,306 17.2%	4,909 25.6%	3,338 17.4%	2,912 15.2%	19,177 0.5%
Unknown	6,064 4.7%	12,040 9.3%	147 0.1%	24 0.0%	0 0.0%	0 0.0%	0 0.0%	78,863 61.2%	128,800 3.4%
Total	1,863,648 49.1%	1,443,812 38.0%	151,919 4.0%	64,479 1.7%	13,943 0.4%	9,540 0.3%	3,364 0.1%	207,341 5.5%	3,798,104 100.0%

*For each treatment category, the first data row shows the number of injuries and the second row shows the percentage of the row total. The row totals include the number of "unknown if injured."

Occupant Injury Data

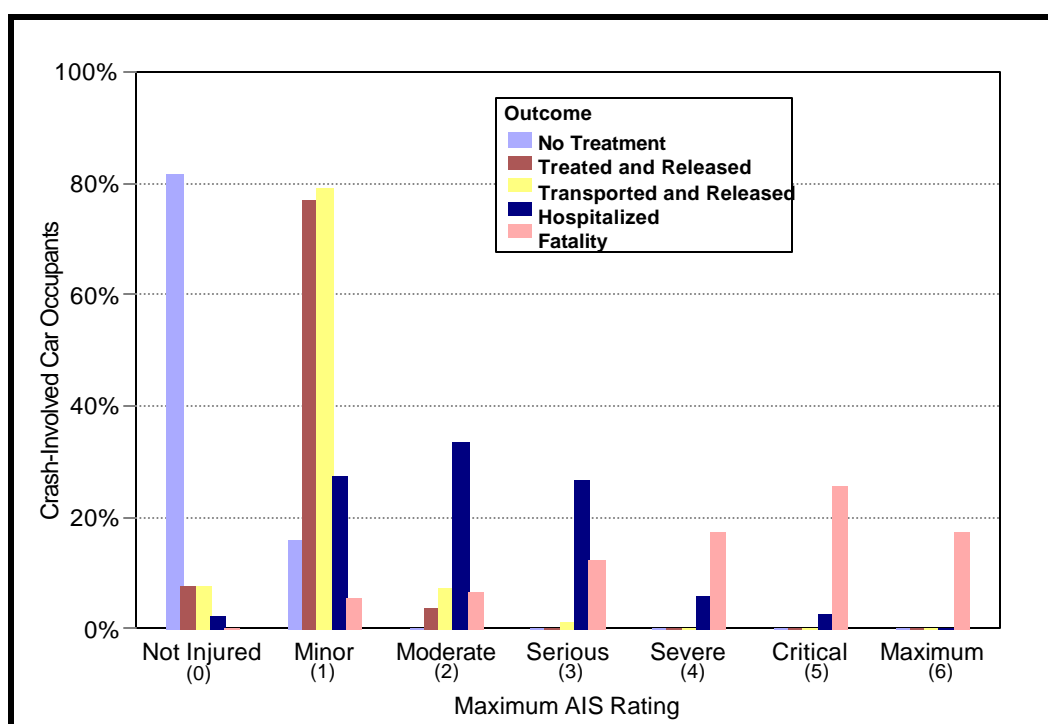
Table 14
Distribution of Crash-Involved Light Truck Occupants by Treatment
and Maximum Injury Severity: Average per Year, 1994-1996

Treatment	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	646,139 85.9%	87,387 11.6%	60 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	17,652 2.3%	752,000 61.4%
Treated at Scene	15,165 19.1%	57,849 72.7%	1,509 1.9%	41 0.1%	0 0.0%	0 0.0%	0 0.0%	4,883 6.1%	79,522 6.5%
Transported and Released	11,329 3.9%	240,825 83.1%	26,066 9.0%	1,477 0.5%	0 0.0%	0 0.0%	0 0.0%	9,957 3.4%	289,653 23.7%
Hospitalized 1-2 Days	392 1.2%	12,142 35.7%	14,412 42.4%	3,769 11.1%	1,423 4.2%	157 0.5%	0 0.0%	1,658 4.9%	34,001 2.8%
3-7 Days	42 0.3%	3,154 19.5%	5,267 32.6%	6,080 37.7%	1,422 8.8%	141 0.9%	0 0.0%	32 0.2%	16,138 1.3%
8-14 Days	6 0.1%	110 1.8%	1,829 30.4%	2,793 46.4%	989 16.4%	285 4.7%	0 0.0%	4 0.1%	6,016 0.5%
15-30 Days	0 0.0%	25 0.6%	1,748 40.1%	1,970 45.2%	288 6.6%	301 6.9%	0 0.0%	24 0.6%	4,355 0.4%
>30 Days	0 0.0%	0 0.0%	120 13.2%	359 39.5%	275 30.3%	152 16.7%	3 0.3%	0 0.0%	908 0.1%
Fatal	0 0.0%	529 5.7%	325 3.5%	983 10.7%	1,828 19.8%	2,120 23.0%	1,598 17.3%	1,836 19.9%	9,220 0.8%
Unknown	2,093 6.4%	1,086 3.3%	30 0.1%	18 0.1%	0 0.0%	0 0.0%	0 0.0%	21,726 66.4%	32,700 2.7%
Total	675,165	403,107	51,367	17,490	6,225	3,156	1,601	57,770	1,224,514

Occupant Injury Data

The annual incidence of crash-involved car occupants as a function of maximum injury severity and injury outcome is shown in Figure 7. This figure illustrates how injury outcome progresses from "No Treatment" to "Fatality," as the maximum injury severity increases from "None" to "Untreatable" (Fatal). Similar comments apply for light truck occupants, as shown in Table 14.

Figure 7
Annual Incidence of Injured Crash-Involved Car Occupants,
by Maximum Injury Severity and Treatment, 1994-1996



Effect of Alcohol Use on Injury Risk

The presence of alcohol in a motor vehicle driver increases (a) the likelihood of being involved in a crash, (b) the severity of the crash, and possibly the severity of the outcome in terms of survivability. In this report, alcohol reporting is based on the police officer's assessment at the time of the crash.

Table 15 shows that, for drivers of passenger cars, those whose age is between 25 and 34 have the highest alcohol use rate, followed by the 35 through 44 age range and then the 21- through 24-year-old drivers. Table 16 shows that, for drivers of light trucks, those whose age is between 25 and 34 have the highest alcohol use rate, followed by drivers 15 through 20 years old and then by those 35 through 44 years old. Drivers of light trucks have almost twice the alcohol use rate of passenger car drivers. These percentages are based on the "Total Known."

Table 17 shows that, for drivers of passenger cars, as the severity of the injury increases so does the presence of alcohol. Drivers in towed passenger cars with alcohol present had MAIS 3-6 injury rates almost 3 times those for drivers with no alcohol present. Approximately 24 percent of the MAIS 6 injuries are the result of alcohol involvement, followed by 23 percent of the MAIS 5 injuries and 18 percent of the MAIS 4 injuries. Table 18 describes the same pattern for drivers of towed light trucks. Drivers in towed light trucks with alcohol present had MAIS 3-6 injury rates at least twice those for drivers with no alcohol present.

Occupant Injury Data

Table 15
Distribution of Crash-Involved Car Drivers
by Age Group and Alcohol Use: Average per Year, 1994-1996

Police-Reported Alcohol Use	Age Group (Years)							Total
	15-20	21-24	25-34	35-44	45-64	\$65	Unknown	
No Alcohol Present	447,146 20.9%	280,812 13.1%	480,055 22.4%	363,468 17.0%	354,019 16.5%	205,835 9.6%	11,205 0.5%	2,142,538 84.6%
Alcohol Present	27,404 14.8%	27,984 15.1%	64,193 34.7%	36,986 20.0%	19,355 10.5%	4,851 2.6%	4,130 2.2%	184,903 7.3%
Not Reported	42,743 27.0%	15,643 9.9%	26,115 16.5%	20,563 13.0%	21,752 13.7%	16,171 10.2%	15,355 9.7%	158,342 6.3%
Not Coded	5,997 12.7%	12,095 25.6%	7,870 16.7%	3,878 8.2%	3,617 7.7%	799 1.7%	12,929 27.4%	47,186 1.9%
Total	523,290 20.7%	336,533 13.3%	578,233 22.8%	424,894 16.8%	398,743 15.7%	227,657 9.0%	43,619 1.7%	2,532,969 100.0%

For each police-reported alcohol category, the first data row shows the number of drivers and the second row shows the percentage of the row total.

Not Reported: Variable is not available on the police crash report.

Not Coded: Police Office did not provide the information.

Table 16
Distribution of Crash-Involved Light Truck Drivers
by Age Group and Alcohol Use: Average per Year, 1994-1996

Police-Reported Alcohol Use	Age Group (Years)							Total
	15-20	21-24	25-34	35-44	45-64	\$65	Unknown	
No Alcohol Present	121,117 18.9%	60,306 9.4%	161,778 25.3%	140,285 21.9%	127,989 20.0%	26,800 4.2%	1,582 0.2%	639,857 82.1%
Alcohol Present	17,463 20.2%	13,892 16.1%	21,421 24.8%	15,834 18.3%	15,329 17.7%	760 0.9%	1,768 2.0%	86,466 11.1%
Not Reported	5,183 15.0%	2,079 6.0%	14,553 42.3%	4,950 14.4%	5,309 15.4%	718 2.1%	1,652 4.8%	34,442 4.4%
Not Coded	3,016 16.1%	1,748 9.4%	1,848 9.9%	2,314 12.4%	1,669 8.9%	1,783 9.5%	6,308 33.8%	18,685 2.4%
Total	146,778 18.8%	78,024 10.0%	199,599 25.6%	163,382 21.0%	150,295 19.3%	30,062 3.9%	11,310 1.5%	779,450 100.0%

For each police-reported alcohol category, the first data row shows the number of drivers and the second row shows the percentage of the row total.

Not Reported: Variable is not available on the police crash report.

Not Coded: Police Office did not provide the information.

Occupant Injury Data

Table 17
Distribution of Crash-Involved Car Drivers by Alcohol Use
and Maximum Injury Severity: Average per Year, 1994-1996

Police- Reported Alcohol Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
No Alcohol Present	1,017,247 47.5%	862,458 40.3%	90,720 4.2%	35,973 1.7%	5,252 0.2%	3,603 0.2%	805 0.0%	121,243 5.7%	2,142,538 84.6%
Alcohol Present	69,748 37.7%	78,238 42.3%	13,002 7.0%	5,983 3.2%	1,765 1.0%	1,556 0.8%	487 0.3%	11,807 6.4%	184,903 7.3%
Not Reported	64,537 40.8%	65,731 41.5%	6,397 4.0%	1,917 1.2%	692 0.4%	561 0.4%	528 0.3%	6,326 4.0%	158,342 6.3%
Not Coded	22,310 47.3%	10,273 21.8%	1,637 3.5%	2,082 4.4%	1,903 4.0%	1,082 2.3%	180 0.4%	1,550 3.3%	47,186 1.9%
Total	1,173,842 46.3%	1,016,701 40.1%	111,756 4.4%	45,954 1.8%	9,612 0.4%	6,802 0.3%	2,000 0.1%	140,925 5.6%	2,532,969 100.0%

Table 18
Distribution of Crash-Involved Light Truck Drivers by Alcohol Use
and Maximum Injury Severity: Average per Year, 1994-1996

Police- Reported Alcohol Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
No Alcohol	330,223	239,746	21,865	8,342	2,355	1,225	372	35,281	639,857
Present	51.6%	37.5%	3.4%	1.3%	0.4%	0.2%	0.1%	5.5%	82.1%
Alcohol	32,964	40,353	5,033	1,771	1,165	471	147	2,782	86,466
Present	38.1%	46.7%	5.8%	2.0%	1.3%	0.5%	0.2%	3.2%	11.1%
Not Reported	19,772	5,328	6,136	336	112	115	111	2,416	34,442
	57.4%	15.5%	17.8%	1.0%	0.3%	0.3%	0.3%	7.0%	4.4%
Not Coded	4,489	3,079	1,860	1,045	781	233	819	992	18,685
	24.0%	16.5%	10.0%	5.6%	4.2%	1.2%	4.4%	5.3%	2.4%
Total	387,447	288,506	34,894	11,495	4,413	2,044	1,450	41,470	779,450

For each police-reported alcohol use category, the first data row shows the number of drivers involved and the second row shows the percentage of the row total. The row totals include the number of "unknown if injured."

Not Reported: Variable is not available on the police crash report.

Not Coded: Police Office did not provide the information.

Occupant Injury Data

Body Regions Injured in Traffic Crashes

There are about 2,544,000 cars towed away from traffic crashes every year. The incidence of crash-involved occupants in these cars is about 3,800,000 per year. Of these, about 1,934,000 car occupants per year are injured, incurring about 4,844,000 injuries of various severities, in various body regions, and by various injury contacts. Table 19 shows the distribution of all injuries incurred by injured occupants of crash-involved cars (as opposed to each occupant's most severe injury, reported in Tables 9-18) as a function of injury severity and injured body region. Table 20 shows the same distribution for injured occupants of light trucks.

The numbers for "injured, severity unknown" (AIS=7) are lower in these tables than in tables using maximum AIS (MAIS), because of the level of information available for coding the injuries. An AIS of 7 is assigned to an injury when there is not sufficient information about the injury available. An MAIS of 7 is assigned to an occupant when it is known that the occupant was injured, but no information about the injury is available. Therefore, an occupant with an MAIS of 7 may not have any associated injuries coded.

Table 19 Distribution of All Injuries to Crash-Involved Car Occupants by Body Region and Severity: Average per Year, 1994-1996								
Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Head (Brain)	39,344 27.1% 0.9%	62,493 43.1% 19.6%	22,228 15.3% 16.6%	11,435 7.9% 36.9%	8,751 6.0% 57.2%	747 0.5% 20.2%	0 0.0% 0.0%	144,998
Head (Skull)	0 0.0% 0.0%	3,534 30.3% 1.1%	5,511 47.3% 4.1%	2,171 18.6% 7.0%	0 0.0% 0.0%	443 3.8% 12.0%	0 0.0% 0.0%	11,658
Head (Other)	0 0.0% 0.0%	442 5.1% 0.1%	21 0.2% 0.0%	47 0.5% 0.2%	38 0.4% 0.2%	0 0.0% 0.0%	8,117 93.7% 31.4%	8,666
Face	74,232 76.8% 1.7%	17,465 18.1% 5.5%	4,810 5.0% 3.6%	107 0.1% 0.3%	0 0.0% 0.0%	0 0.0% 0.0%	42 0.0% 0.2%	96,654
Neck	371,631 99.3% 8.6%	236 0.1% 0.1%	35 0.0% 0.0%	22 0.0% 0.1%	0 0.0% 0.0%	10 0.0% 0.3%	2,240 0.6% 8.7%	374,174
Chest	28,607 25.2% 0.7%	24,818 21.8% 7.8%	34,755 30.6% 26.0%	10,673 9.4% 34.4%	4,087 3.6% 26.7%	1,876 1.7% 50.7%	8,812 7.8% 34.1%	113,628
Shoulder and Back	196,256 78.1% 4.5%	49,404 19.7% 15.5%	4,222 1.7% 3.2%	90 0.0% 0.3%	0 0.0% 0.0%	0 0.0% 0.0%	1,423 0.6% 5.5%	251,395

*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

Table 19 (Continued)
Distribution of All Injuries to Crash-Involved Car Occupants
by Body Region and Severity: Average per Year, 1994-1996

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Abdomen	809 2.2% 0.0%	20,263 55.6% 6.4%	4,557 12.5% 3.4%	5,052 13.9% 16.3%	1,326 3.6% 8.7%	4 0.0% 0.1%	4,421 12.1% 17.1%	36,432
Spine	0 0.0% 0.0%	0 0.0% 0.0%	467 16.9% 0.3%	1,372 49.7% 4.4%	732 26.5% 4.8%	192 6.9% 5.2%	0 0.0% 0.0%	2,763
Upper Extremities	61,518 50.9% 1.4%	35,663 29.5% 11.2%	23,057 19.1% 17.3%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	651 0.5% 2.5%	120,889
Pelvis	0 0.0% 0.0%	16,954 66.8% 5.3%	8,377 33.0% 6.3%	23 0.1% 0.1%	36 0.1% 0.2%	0 0.0% 0.0%	0 0.0% 0.0%	25,390
Lower Extremities	42,337 28.0% 1.0%	83,608 55.3% 26.2%	25,231 16.7% 18.9%	6 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	132 0.1% 0.5%	151,313
Skin	3,500,721 99.9% 81.1%	3,793 0.1% 1.2%	241 0.0% 0.2%	0 0.0% 0.0%	7 0.0% 0.0%	430 0.0% 11.6%	0 0.0% 0.0%	3,505,192
All Other	11 2.2% 0.0%	16 3.2% 0.0%	129 25.6% 0.1%	33 6.6% 0.1%	315 62.6% 2.1%	0 0.0% 0.0%	0 0.0% 0.0%	503
Total	4,315,465	318,690	133,639	31,030	15,293	3,702	25,837	4,843,655

*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

Table 20
Distribution of All Injuries to Crash-Involved Light Truck Occupants
by Body Region and Severity: Average per Year, 1994-1996

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Head (Brain)	16,450 27.3% 1.2%	26,768 44.5% 21.8%	8,485 14.1% 19.1%	5,145 8.6% 40.1%	3,068 5.1% 62.7%	235 0.4% 12.6%	0 0.0% 0.0%	60,150
Head (Skull)	0 0.0% 0.0%	2,157 30.3% 1.8%	3,052 42.9% 6.9%	1,401 19.7% 10.9%	0 0.0% 0.0%	512 7.2% 27.4%	0 0.0% 0.0%	7,122
Head (Other)	0 0.0% 0.0%	12 0.2% 0.0%	0 0.0% 0.0%	85 1.2% 0.7%	0 0.0% 0.0%	0 0.0% 0.0%	6,811 98.6% 58.0%	6,908
Face	22,810 65.2% 1.7%	10,325 29.5% 8.4%	1,843 5.3% 4.1%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	17 0.0% 0.1%	34,995
Neck	89,616 99.9% 6.5%	116 0.1% 0.1%	13 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	6 0.0% 0.3%	0 0.0% 0.0%	89,750
Chest	5,938 20.1% 0.4%	7,354 24.9% 6.0%	8,689 29.4% 19.6%	4,352 14.7% 33.9%	1,041 3.5% 21.3%	542 1.8% 29.0%	1,608 5.4% 13.7%	29,523
Shoulder and Back	46,265 66.6% 3.4%	20,447 29.4% 16.6%	2,748 4.0% 6.2%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	69,460

*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Table 20 (Continued)
Distribution of All Injuries to Crash-Involved Light Truck Occupants
by Body Region and Severity: Average per Year, 1994-1996

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Abdomen	623 4.7% 0.0%	6,640 49.8% 5.4%	985 7.4% 2.2%	1,453 10.9% 11.3%	423 3.2% 8.6%	0 0.0% 0.0%	3,207 24.1% 27.3%	13,330
Spine	0 0.0% 0.0%	0 0.0% 0.0%	150 19.0% 0.3%	406 51.5% 3.2%	200 25.3% 4.1%	34 4.3% 1.8%	0 0.0% 0.0%	789
Upper Extremities	18,569 48.4% 1.4%	14,595 38.0% 11.9%	5,209 13.6% 11.7%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	19 0.0% 0.2%	38,391
Pelvis	0 0.0% 0.0%	5,258 51.8% 4.3%	4,798 47.3% 10.8%	4 0.0% 0.0%	89 0.9% 1.8%	0 0.0% 0.0%	0 0.0% 0.0%	10,150
Lower Extremities	10,598 23.5% 0.8%	26,232 58.2% 21.3%	8,193 18.2% 18.4%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	75 0.2% 0.6%	45,097
Skin	1,164,148 99.7% 84.7%	3,025 0.3% 2.5%	215 0.0% 0.5%	0 0.0% 0.0%	72 0.0% 1.5%	542 0.0% 29.0%	0 0.0% 0.0%	1,168,002
All Other	0 0.0% 0.0%	17 33.3% 0.0%	33 64.7% 0.1%	0 0.0% 0.0%	1 2.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	51
Total	1,375,016	122,945	44,411	12,845	4,894	1,870	11,737	1,573,718

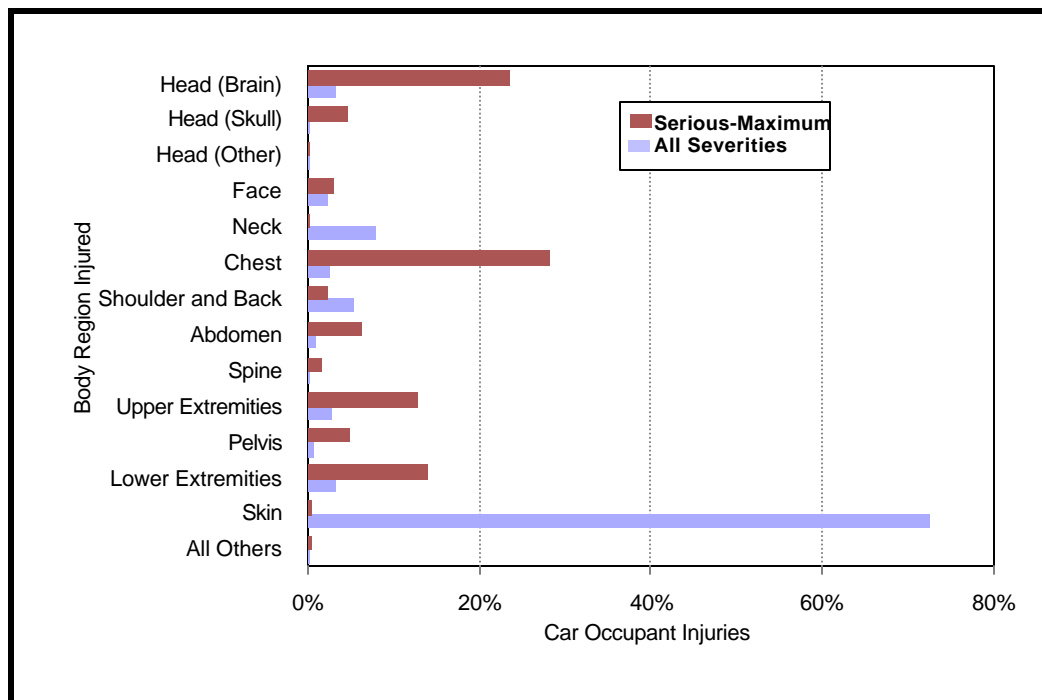
*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

It is apparent from Tables 19 and 20 that the body regions most frequently affected by injuries of all severities are markedly different from those most frequently affected by injuries of high severities (serious-maximum (AIS=3-6)). This is illustrated in Figure 8, where two distributions are shown: one for all severities and one for serious-maximum severities, each adding up to 100 percent.

It is evident in this figure that body regions such as face, neck, shoulder and back, and skin are injured with a high frequency in general, but occur at very low frequencies for serious to maximum severities. Conversely, other body regions, such as the head (brain/skull), chest, spine, abdomen, and upper and lower extremities are injured frequently at high severities, but occur less significantly when all severities are considered.

Figure 8
Distribution of Injuries to Crash-Involved Car Occupants
by Affected Body Region and Severity of Injury, 1994-1996



Belt Use and Body Regions Injured

Figure 9 shows the distribution of crash-involved car occupants by injured body region and belt usage. An occupant may receive more than one injury to a given body region; however, this figure represents one injury per body region per occupant. An occupant may also receive injuries across more than one body region. Therefore, the number for each body region will add up to more than the number of injured occupants. For example, an occupant may have a contusion to the left side of the brain and a laceration to the right side of the brain. The figure counts only one of the injuries to the brain. If the occupant in the example sustained a contusion to the left side of the brain and a skull fracture, then both injuries would be included in the figure, and one injury would be counted in the brain body region while the other injury would be counted in the skull body region. To determine the percent of belted occupants who sustained a brain injury, divide the number of occupants with a brain injury by the total number of occupants using a restraint system. The same methodology applies to the unbelted occupants. The percentages will not add to 100 percent, because the total number of occupants includes those who were not injured. Figure 10 shows a similar distribution of crash-involved occupants of light trucks by belt usage.

Occupant Injury Data

Figure 9
Distribution of Injuries by Body Region to Crash-Involved
Car Occupants by Belt Usage: Average per Year, 1994-1996

Belted

Brain: 48,896 (2.0%)
 Other Head: 2,802 (0.1%)
 Face: 29,064 (1.2%)
 Chest: 57,691 (2.3%)
 Upper
 Extremities: 60,022 (2.4%)
 Abdomen: 10,067 (0.4%)
 Abdomen: 10,945 (1.4%)

Skin: 927,202 (37.7%)

Skull: 6,679 (0.1%)
 Neck: 288,263 (11.7%)
 Shoulder
 and Back: 158,553 (6.4%)
 Spine: 509 (0.0%)
 Pelvis: 5,368 (2.2%)

Lower
 Extremities: 63,210 (2.6%)

**Total
 Belted**

Unbelted

Brain: 59,240 (7.5%)
 Other Head: 4,281 (0.5%)
 Face: 37,269 (4.7%)
 Chest: 26,997 (3.4%)
 Upper
 Extremities: 36,144 (4.6%)

Skin: 437,628 (55.4%)

Skull: 4,548 (0.6%)
 Neck: 63,788 (8.1%)
 Shoulder
 and Back: 52,224 (6.6%)
 Spine: 1,196 (0.2%)
 Pelvis: 11,454 (1.5%)

Lower
 Extremities: 36,435 (4.6%)

**Total
 Unbelted**

Occupant Injury Data

Occupants:
2,460,430

Occupants:
789,094

Occupant Injury Data

Figure 10
Distribution of Injuries by Body Region to Crash-Involved
Light Truck Occupants by Belt Usage: Average per Year, 1994-1996

Belted

Brain: 17,868 (2.4%)
 Other Head: 728 (0.1%)
 Face: 5,689 (0.8%)
 Chest: 8,941 (1.2%)
 Upper
 Extremities: 19,615 (2.6%)
 Abdomen: 2,040 (0.3%)

Skin: 248,173 (33.3%)

Skull: 700 (0.1%)
 Neck: 64,413 (8.7%)
 Shoulder
 and Back: 27,922 (3.8%)
 and Back: 25,248 (8.2%)
 Spine: 195 (0.0%)
 Pelvis: 1,952 (0.3%)

Lower
 Extremities: 10,734 (1.4%)

**Total
 Belted**

Unbelted

Brain: 29,936 (9.7%)
 Other Head: 6,015 (2.0%)
 Face: 16,690 (5.4%)
 Chest: 12,294 (4.0%)
 Upper
 Extremities: 8,752 (2.8%)
 Abdomen: 6,432 (2.1%)

Skin: 164,253 (53.4%)

Skull: 3,828 (1.2%)
 Neck: 20,190 (6.6%)
 Shoulder
 and Back: 27,922 (3.8%)
 and Back: 25,248 (8.2%)
 Spine: 445 (0.1%)
 Pelvis: 4,391 (1.4%)

Lower
 Extremities: 15,161 (4.9%)

**Total
 Unbelted**

Occupant Injury Data

Occupants:
744,397

Occupants:
307,417

Occupant Injury Data

Injury Contacts

In addition to data on injured body regions, crash protection practitioners need data concerning the various sources of injury (injury contacts). A summary of injury contacts for injuries to crash-involved occupants is presented in Table 21 for cars and in Table 22 for light trucks. Table 21 shows the distribution of all crash-involved car occupant injuries as a function of injury severity and injury contact. Table 22 shows the same distribution for light truck occupants.

Table 21 (Continued)								
Distribution of All Injuries to Crash-Involved Car Occupants by Injury Contact and Severity, Average over Year 1994-1996								
Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Floor	69,179	32,556	4,214	40	0	0	0	104,950
Steering Assembly	437,466	43,401	21,588	4,360	0,069	0,053	0,038	513,335
Non-Contact Injuries	570,404	13,387	1660	1414	1247	17,632	1580	579,847
Instrument Panel	643,057	49,049	18,888	1,524	3,655	0,165	3,444	713,931
Fire in Vehicle	14,439	15,471	1424	3,671	4,371	11,420	2,971	1,123
Windshield	382,120	20,083	7,549	2,187	0,065	11,659	2,051	415,326
Ground	338,597	56,878	25,892	17,306	7,452	11,998	7,291	44,523
Interior Side Surface	328,279	35,832	21,260	5,237	1,031	0,316	0,989	390,094
Exterior (Occupant's Vehicle) Pillars	80,342	12,091	5,495	2,237	5,500	5,536	0,867	108,244
Exterior (Other Vehicle or Exterior Obstacle) (Belt System)	500,003	15,662	8,247	1,655	4,344	9,654	3,671	528,727
Side and Rear Glazing	651,767	64,098	68,614	52,311	21,211	0,411	11,791	73,179
Child Seat	9,287	1,656	0,744	0,791	1,135	0,124	0,414	7,059
All Others	221,048	15,429	6,899	939	0,231	0,411	0,704	245,728
Air Bag	256,490	2,305	1,122	3,119	1,393	0,438	2,146	260,813
Unknown	402,328	38,422	17,482	51,392	22,561	160	110,162	477,868
Head Restraints	40,841	1,988	13,485	17,185	16,835	16,330	43,189	46,623
Total	4,315,941	318,699	133,689	31,039	15,229	3,702	25,837	4,843,655
Seat Back	175,756	12,920	6,902	568	111	17	88	196,264
*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.								
	89.5%	6.6%	3.5%	0.3%	0.1%	0.0%	0.0%	
	4.1%	4.1%	5.2%	1.8%	0.7%	0.5%	0.8%	
	76.3%	12.6%	5.7%	2.7%	1.7%	0.2%	0.9%	
	2.0%	4.5%	4.8%	9.7%	12.5%	5.5%	4.0%	

*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

Table 22
Distribution of All Injuries to Crash-Involved Light Truck Occupants
by Injury Contact and Severity: Average per Year, 1994-1996

Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Steering Assembly	140,269 84.0% 10.2%	14,345 8.6% 11.7%	5,124 3.1% 11.5%	2,124 1.3% 16.5%	612 0.4% 12.5%	172 0.1% 9.2%	4,263 2.6% 36.3%	166,908
Instrument Panel	213,041 87.7% 15.5%	21,541 8.9% 17.5%	7,723 3.2% 17.4%	350 0.1% 2.7%	177 0.1% 3.6%	28 0.0% 1.5%	124 0.1% 1.1%	242,983
Windshield	115,717 90.9% 8.4%	5,810 4.6% 4.7%	905 0.7% 2.0%	410 0.3% 3.2%	235 0.2% 4.8%	219 0.2% 11.7%	3,975 3.1% 33.9%	127,271
Interior Side Surface	99,319 84.8% 7.2%	9,230 7.9% 7.5%	6,784 5.8% 15.3%	1,180 1.0% 9.2%	307 0.3% 6.3%	113 0.1% 6.0%	120 0.1% 1.0%	117,055
Pillars	39,192 77.1% 2.9%	8,398 16.5% 6.8%	1,797 3.5% 4.0%	953 1.9% 7.4%	323 0.6% 6.6%	0 0.0% 0.0%	200 0.4% 1.7%	50,863
Restraint (Belt) System	133,932 96.9% 9.7%	2,498 1.8% 2.0%	1,225 0.9% 2.8%	252 0.2% 2.0%	0 0.0% 0.0%	0 0.0% 0.0%	326 0.2% 2.8%	138,233
Child Seat	3,383 90.0% 0.2%	290 7.7% 0.2%	82 2.2% 0.2%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	5 0.1% 0.0%	3,760
Air Bag	25,636 93.8% 1.9%	1,542 5.6% 1.3%	161 0.6% 0.4%	0 0.0% 0.0%	0 0.0% 0.0%	3 0.0% 0.2%	2 0.0% 0.0%	27,345
Head Restraints	13,059 90.2% 0.9%	1,395 9.6% 1.1%	4 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	21 0.1% 0.2%	14,479
Seat Back	40,555 87.9% 2.9%	4,840 10.5% 3.9%	451 1.0% 1.0%	204 0.4% 1.6%	71 0.2% 1.5%	0 0.0% 0.0%	16 0.0% 0.1%	46,137
Roof	53,157 78.4% 3.9%	9,292 13.7% 7.6%	3,134 4.6% 7.1%	986 1.5% 7.7%	647 1.0% 13.2%	173 0.3% 9.3%	374 0.6% 3.2%	67,763

*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Occupant Injury Data

Table 22 (Continued)
Distribution of All Injuries to Crash-Involved Light Truck Occupants
by Injury Contact and Severity: Average per Year, 1994-1996

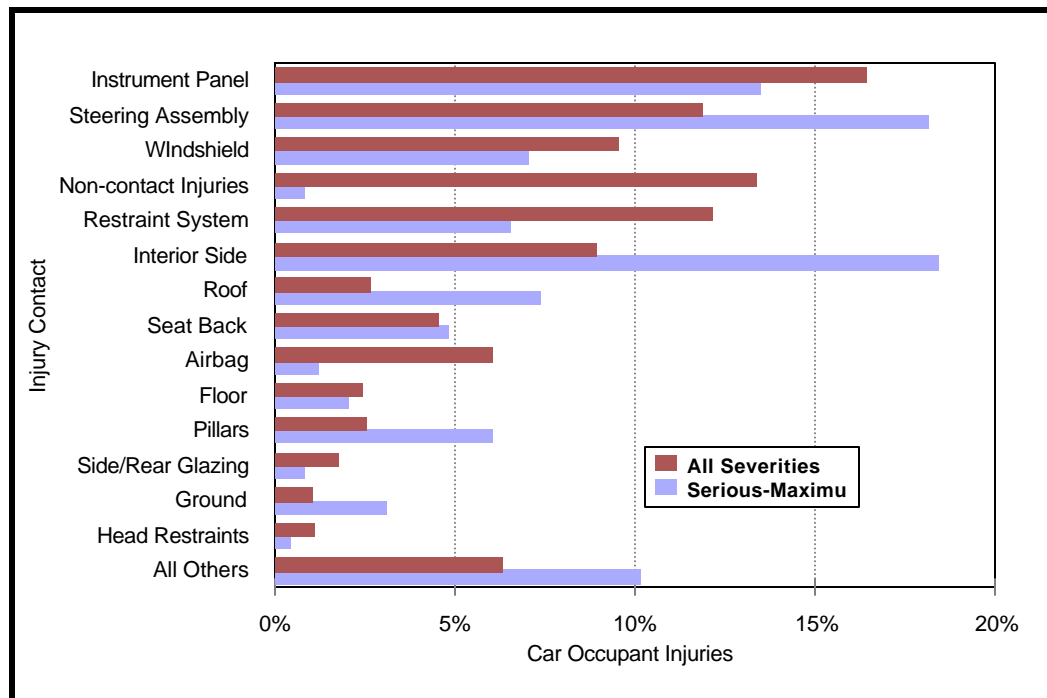
Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Floor	17,642 64.7% 1.3%	9,014 33.1% 7.3%	613 2.2% 1.4%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	0 0.0% 0.0%	27,268
Non-Contact Injuries	163,317 99.2% 11.9%	755 0.5% 0.6%	315 0.2% 0.7%	18 0.0% 0.1%	182 0.1% 3.7%	26 0.0% 1.4%	14 0.0% 0.1%	164,627
Fire in Vehicle	29 4.1% 0.0%	0 0.0% 0.0%	67 9.5% 0.2%	0 0.0% 0.0%	70 9.9% 1.4%	542 76.6% 29.0%	0 0.0% 0.0%	708
Ground	44,973 67.8% 3.3%	12,231 18.4% 9.9%	5,416 8.2% 12.2%	2,051 3.1% 16.0%	963 1.5% 19.7%	59 0.1% 3.2%	616 0.9% 5.2%	66,309
Exterior (Occupant's Vehicle)	5,446 42.5% 0.4%	4,046 31.6% 3.3%	2,057 16.1% 4.6%	907 7.1% 7.1%	238 1.9% 4.9%	64 0.5% 3.4%	55 0.4% 0.5%	12,814
Exterior (Other Vehicle or Exterior Object)	2,206 34.6% 0.2%	1,430 22.4% 1.2%	1,531 24.0% 3.4%	662 10.4% 5.2%	256 4.0% 5.2%	157 2.5% 8.4%	138 2.2% 1.2%	6,380
Side and Rear Glazing	27,617 92.2% 2.0%	1,538 5.1% 1.3%	744 2.5% 1.7%	22 0.1% 0.2%	12 0.0% 0.2%	0 0.0% 0.0%	23 0.1% 0.2%	29,956
All Others	86,759 94.6% 6.3%	3,781 4.1% 3.1%	815 0.9% 1.8%	216 0.2% 1.7%	74 0.1% 1.5%	0 0.0% 0.0%	54 0.1% 0.5%	91,699
Unknown	149,766 87.5% 10.9%	10,969 6.4% 8.9%	5,466 3.2% 12.3%	2,509 1.5% 19.5%	726 0.4% 14.8%	313 0.2% 16.7%	1,410 0.8% 12.0%	171,160
Total	1,375,016	122,945	44,411	12,845	4,894	1,870	11,737	1,573,718

*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

It is evident from Tables 21 and 22 that the most frequent injury contacts for injuries of all severities (AIS 1-7) are not necessarily the same as those that are most frequently involved in serious to maximum injuries (AIS 3-6). This is illustrated in Figure 11, where two distributions are shown: one for all severities and one for serious to maximum severities, each adding up to 100 percent.

As can be seen in this figure, the instrument panel, windshield, and restraint system as injury contacts have high frequencies in general but relatively low frequencies for serious to maximum injuries. The converse is observed for the steering assembly, interior side, roof, pillars, and ground.

Figure 11
Distribution of Injuries to Crash-Involved Car Occupants



by Injury Contact and Severity of Injury, 1994-1996

Note: All Others category includes items shown in Table 22 (child seat and exterior of occupant's vehicle, other vehicle, or exterior object). Unknowns are excluded from Figure 11.

Occupant Ejection and Entrapment

Table 23 shows the rates of occupant ejections from and entrapment in crash-involved towed cars. Two degrees of ejection are distinguished: complete and partial. The results in Table 23 are shown by primary crash modes and areas of damage. Similar data for light trucks are shown in Table 24. Ejection rates by degree of ejection are also shown in Figure 12. Ejection occurs most frequently in rollover crashes, followed by side impacts.

Table 23 Occupant Ejection and Entrapment in Crash-Involved Towed Cars by Degree of Ejection, Crash Mode, and Area of Damage: Average of Nationally Weighted Counts per Year, 1994-1996				
Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	8,519 5.0%	4,437 2.6%	895 0.5%	169,975 4.5%
Nonrollover				
Single-Vehicle Front	966 0.2%	897 0.2%	3,360 0.6%	540,818 14.2%
Side	2,094 1.2%	2,514 1.5%	1,552 0.9%	173,215 4.6%
Rear, Top, or Under	21 0.1%	53 0.2%	5 0.0%	28,693 0.8%
Multiple-Vehicle Front	542 0.0%	1,537 0.1%	4,377 0.3%	1,599,086 42.1%
Side	1,897 0.2%	2,392 0.2%	2,294 0.2%	967,262 25.5%
Rear	343 0.1%	353 0.1%	30 0.0%	315,810 8.3%
Top or Under	0 0.0%	0 0.0%	0 0.0%	3245 0.1%
Total	14,380 0.4%	12,182 0.3%	12,514 0.3%	3,798,104 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Note: Damage Area "Unknown" has been imputed into the known damage areas.

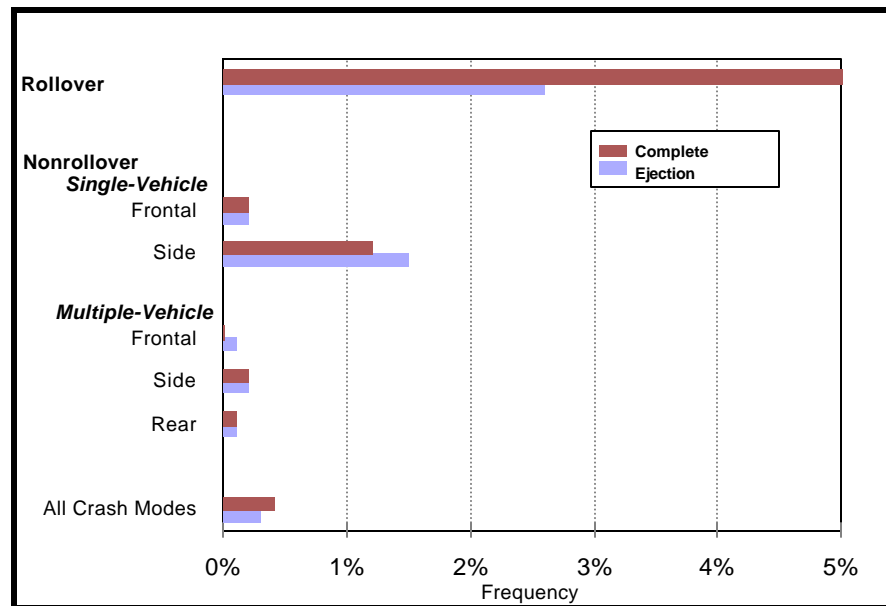
Table 24
Occupant Ejection and Entrapment in Crash-Involved Towed Light Trucks
by Degree of Ejection, Crash Mode, and Area of Damage:
Average of Nationally Weighted Counts per Year, 1994-1996

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	14,915 7.9%	5,839 3.1%	2,009 1.1%	189,068 15.4%
Nonrollover				
Single-Vehicle				
Front	648 0.3%	853 0.4%	851 0.4%	210,853 17.2%
Side	303 0.9%	426 1.3%	284 0.9%	33,274 2.7%
Rear, Top, or Under	3 0.0%	0 0.0%	13 0.1%	9,774 0.8%
Multiple-Vehicle				
Front	1,239 0.2%	403 0.1%	1,492 0.3%	548,477 44.8%
Side	3,483 1.9%	231 0.1%	378 0.2%	182,021 14.9%
Rear	261 0.5%	576 1.1%	262 0.5%	51,007 4.2%
Top or Under	0 0.0%	0 0.0%	11 26.8%	41 0.0%
Total	20,851 1.7%	8,328 0.7%	5,301 0.4%	1,224,514 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Note: Damage Area "Unknown" has been imputed into the known damage areas.

Figure 12
Towed Car Occupant Ejection Rates
by Crash Mode and Degree of Ejection, 1994-1996



The ejection rates shown in Tables 23 and 24 are generally small, except in rollovers. However, due to the very harmful outcomes of occupant ejections, the rate of injuries associated with occupant ejections is significantly higher, as shown in Tables 25 and 26, which show injury-weighted (using Harm—see Appendix E) ejection and entrapment data for crash-involved towed vehicles, and Figure 13, which shows ejection-induced injury rates for towed vehicles. Crashes that involve ejection are generally more severe crashes; therefore, injuries to ejected occupants may be due to higher crash forces as well as the ejection itself.

Table 25 Injury-Weighted Occupant Ejection and Entrapment Rates for Crash-Involved Towed Cars by Degree of Ejection, Crash Mode, and Area of Damage: Average of Nationally Weighted Counts per Year, 1994-1996				
Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	1,530,211 28.1%	692,621 12.7%	240,247 4.4%	5,447,957 13.3%
Nonrollover				
Single-Vehicle				
Front	231,088 3.6%	205,417 3.2%	528,442 8.3%	6,385,927 15.6%
Side	310,520 11.6%	277,245 10.3%	388,920 14.5%	2,681,532 6.6%
Rear, Top, or Under	96 0.0%	20,599 7.7%	102 0.0%	268,703 0.7%
Multiple-Vehicle				
Front	195,819 1.4%	262,602 1.9%	1,217,441 8.7%	13,985,807 34.2%
Side	392,455 3.8%	601,447 5.8%	652,889 6.3%	10,342,682 25.3%
Rear	21,819 1.2%	23,131 1.3%	10,682 0.6%	1,787,654 4.4%
Top or Under	0 0.0%	0 0.0%	0 0.0%	15798 0.0%
Total	2,682,008 6.6%	2,083,062 5.1%	3,038,723 7.4%	40,916,061 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Occupant Injury Data

Table 26
Injury-Weighted Occupant Ejection and Entrapment Rates
for Crash-Involved Towed Light Trucks
by Degree of Ejection, Crash Mode, and Area of Damage:
Average of Nationally Weighted Counts per Year, 1994-1996

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	2,555,014 47.2%	532,049 9.8%	272,969 5.0%	5,413,543 37.0%
Nonrollover				
Single-Vehicle				
Front	332,549 14.9%	99,429 4.5%	302,974 13.6%	2,224,462 15.2%
Side	68,142 10.1%	146,592 21.8%	139,640 20.7%	673,111 4.6%
Rear, Top, or Under	87 0.6%	0 0.0%	10,975 73.2%	14,986 0.1%
Multiple-Vehicle				
Front	56,032 1.5%	159,534 4.3%	316,014 8.5%	3,730,416 25.5%
Side	529,300 24.2%	84,621 3.9%	67,037 3.1%	2,184,444 14.9%
Rear	1,307 0.3%	2,473 0.6%	901 0.2%	383,908 2.6%
Top or Under	0 0.0%	0 0.0%	8305 66.5%	12493 0.1%
Total	3,542,432 24.2%	1,024,699 7.0%	1,118,815 7.6%	14,637,363 100.0%

*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Figure 13
Ejection-Induced Occupant Injury Rates for Crash-Involved
Towed Cars by Degree off Ejection and Crash Mode, 1994-1996

